

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371ATTORNEY'S DOCKET NO  
SCHIERZ ET AL-1 (PCT)

U.S. APPLICATION NO (if known, see 37 CFR 1.5)

09/600847

INTERNATIONAL APPLICATION NO.  
PCT/EP99/09881INTERNATIONAL FILING DATE  
DECEMBER 14, 1999PRIORITY DATE CLAIMED  
DECEMBER 16, 1998

TITLE OF INVENTION BEARING MAT FOR SUPPORTING AN EXHAUST GAS CATALYST

APPLICANT(S) FOR DO/EO/US CLAUS SCHIERZ and BERNHARD KOHLSDORF

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
- This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
- This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
- A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
- A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - is transmitted herewith (required only if not transmitted by the International Bureau)
  - has been transmitted by the International Bureau.
  - is not required, as the application was filed in the United States Receiving Office (RO/US).
- A translation of the International Application into English (35 U.S.C. 371(c)(2)).
- Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
  - a. are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. have been transmitted by the International Bureau.
  - c. have not been made; however, the time limit for making such amendments has NOT expired.
  - d. have not been made and will not be made.
- A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

## as 11. to 16. below concern other document(s) or information included:

- An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
- An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- A **FIRST** preliminary amendment.
- A **SECOND** or **SUBSEQUENT** preliminary amendment.
- A substitute specification.
- A change of power of attorney and/or address letter.
- Other items or information:

PCT/ISA/210 - Int'l. Search Report  
 One Sheet of a Formal Drawing  
 Forms 101, 301, 304 and 1031.1

PLICATION NO. (if known, see 37 CFR 1.5)

**09/600847**INTERNATIONAL APPLICATION NO  
PCT/EP99/09881ATTORNEY'S DOCKET NO  
SCHIERZ ET AL-1  
(PCT) The following fees are submitted:**Basic National Fee (37 CFR 1.492(a)(1)-(5)):**

Search Report has been prepared by the EPO or JPO.....\$840.00

International preliminary examination fee paid to USPTO (37 CFR 1.482).....\$670.00

Neither international preliminary examination fee paid (37 CFR 1.82) nor  
international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....\$970.00International preliminary examination fee paid to USPTO (37 CFR 1.482)  
and all claims satisfied provisions of PCT Article 33(2)-(4).....\$96

CALCULATIONS

PTO USE ONLY

\$ 840.00

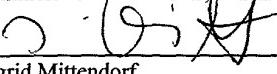
**ENTER APPROPRIATE BASIC FEE AMOUNT =**charge of \$130.00 for furnishing the oath or declaration later than \_\_\_\_ 20 \_\_\_\_ 30  
days from the earliest claimed priority date (37 CFR 1.492(e)).

Claims	Number Filed	Number Extra	Rate	
Total Claims	5 - 20 =	- 0 -	X \$18.00	\$
Dependent Claims	1 - 3 =	- 0 -	X \$78.00	\$
Multiple dependent claim(s) (if applicable)			+ \$260.00	\$
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 840.00
Action by 11/2 for filing by small entity, if applicable. Verified Small Entity statement also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$
<b>SUBTOTAL =</b>				\$ 840.00
Fees of \$130.00 for furnishing the English translation later than ____ 20 ____ 30 days from the earliest claimed priority date (37 CFR 1.492(f)). +				\$
<b>TOTAL NATIONAL FEE =</b>				\$ 840.00
or recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				See cover sheet attached to assign \$ to be charged to Deposit Acct
<b>TOTAL FEES ENCLOSED =</b>				\$ 840.00
				Amount to be: refunded \$
				charged \$

 A check in the amount of \$840.00 to cover the above fees is enclosed. Please charge my Deposit Account No. 03-2468 in the amount of \$ \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 03-2468. A duplicate copy of this sheet is enclosed.**E: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or  
must be filed and granted to restore the application to pending status.** ALL CORRESPONDENCE TO:ARD & ROE, P.C.  
Northern Boulevard  
n, New York 11576-1696  
365-9802


Signature

Edward R. Freedman  
Reg. No. 26,048

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Ingrid Mittendorf

09/600847

532 Rec'd PCT/PTC 24 JUL 2000

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: CLAUS SCHIERZ ET AL-1 (PCT)

PCT No.: PCT/EP 99/09881 FILED: DECEMBER 14, 1999

TITLE: BEARING MAT FOR SUPPORTING AN EXHAUST GAS CATALYST

PRELIMINARY AMENDMENT

BOX PCT

Ass't. Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

Preliminary to the examination, please amend the above-identified application as follows:

IN THE CLAIMS

Claim 3, line 1, delete "or 2";

Claim 4, lines 1 and 2, delete "any one of claims 1 to 3" and insert --claim 1--;

REMARKS

By this Preliminary Amendment, the multiple dependency of certain of the dependent claims has been removed so as to avoid the surcharge associated therewith. Entry of this amendment is respectfully requested.

Respectfully submitted,  
CLAUS SCHIERZ ET AL

By:

Allison C. Collard, Reg. No. 22,532  
Edward R. Freedman, Reg. No. 25,048  
Attorneys for Applicants

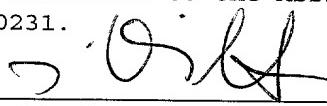
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ERF/llv

EXPRESS MAIL NO. **EL 621 966 815 US**

Date of Deposit: July 24, 2000

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Ingrid Mittendorf

1/PRTS

09/600847  
532 Rec'd PCT/PTC 24 JUL 2000

BEARING MAT FOR SUPPORTING AN EXHAUST GAS CATALYST

The invention relates to a bearing mat for supporting in a metallic catalyst housing an exhaust gas catalyst for cleaning motor vehicle exhaust gases. The bearing mat is arranged on the periphery of the ceramic carrier body of an exhaust gas catalyst and seals the annular gap between the ceramic carrier body and the catalyst housing consisting of a metallic material. Said bearing mat is intended to permit a safe and vibration-free support of the ceramic carrier body and has to compensate any change occurring in the width of the annular gap to be sealed when the metallic catalyst housing expands at the operating temperature preset by the combustion exhaust gases. Furthermore, the bearing mat forms a heat-insulating layer on the inner wall of the catalyst housing and reduces the outwardly transmitted sonic noise generated by the flowing exhaust gases.

Within the framework of the measures known, the bearing mat consists of short inorganic fibers, an organic binding agent, as well as embedded particles consisting of expanding material, for example mica or vermiculite, which expands under the influence of heat and causes the volume of the bearing mat to increase at the operating temperature. The inorganic fibers embedded in the binding agent consist of ceramic staple fibers or crushed SiO<sub>2</sub> filaments with an average length of a few

millimeters (DE-U 93 11 571). A bearing mat with short inorganic fibers exhibits a tendency to erosion and abrasion. The fibers as well as the particulate expanding material are discharged together with the flowing combustion exhaust gases, with the consequence that sealing of the annular gap deteriorates and erosion increases. When a fiber material made of longer filaments is used, there is the risk of fibers being blown out, though only to a lesser extent. However, the formation of bridges and cross-linkage of the filaments obstruct expansion of the mat and the effect of the expanding material is prevented from becoming fully effective. Finally, there is the problem that the expanding property of vermiculite and mica starts to take effect only at high temperatures. The known supporting mats are not suitable or suitable only to a limited extent for exhaust gas catalysts employed for cleaning the combustion exhaust gases of diesel engines because the exhaust temperatures occurring with diesel fuel are inadequate for initiating an expanding effect of the bearing mat.

The invention is based on the problem of proposing a bearing mat for exhaust gas catalysts that is safely prevented from being blown out and which effectively seals the annular gap between the exhaust gas catalyst and the catalyst housing both at low and high exhaust gas temperatures.

The problem is solved according to the invention by a bearing mat in the form of a binding agent-free, multi-layered flat structure consisting of heat-stable threads, said flat structure being mechanically reinforced by quilting seams, whereby

- the threads consist of a crimped yarn of filaments and are fixed by the quilting seams in the flat structure under tensile stress; and
- the quilting seams are produced with a sewing thread with a thermal stability that is lower than the operating temperature of the bearing mat.

Methods for reshaping unstructured filament yarns into crimped, textured yarns with a textile appearance are known. The resulting crimped yarns are voluminous and characterized by high elasticity. According to the invention, the threads consisting of a crimped yarn are laid under tensile stress to form a flat structure that has the usual thickness of bearing mats. The threads are fixed within the flat structure by quilting seams, whereby the tensile stress is maintained. The sewing thread used for the quilting seams consists of a material whose thermal stability is lower than the operating temperature of the bearing mat. When the bearing mat installed in the housing of the catalyst is heated for the first time to the operating temperature preset by the combustion exhaust

gases, the quilting seams are destroyed, whereby deformation energy stored in the crimped yarn is being released as the tensile stress of the thermally stable threads is being relieved. The liberated deformation energy is substantial and permits a considerable increase in the volume of the flat structure. The sealing power of the bearing mat installed between the catalyst housing and the exhaust gas catalyst is accordingly high as soon as the quilting seams have been destroyed when the bearing mat is heated to the operating temperature for the first time. The increase in volume of the bearing mat as defined by the invention, which starts with the dissolution of the quilting seams, is not dependent upon the temperature.

Therefore, the bearing mat as defined by the invention can be employed in connection with both exhaust gas catalysts that are operated with relatively low temperature, and with exhaust gas catalysts for hot combustion exhaust gases, as usually found with Otto engines. Owing to the fact that the bearing mat as defined by the invention contains neither expanding material in the form of particles, nor fractured pieces of fiber material, but exclusively consists of long filament threads, the risk of any erosion or abrasion caused by the flowing combustion exhaust gases is low.

The crimping yarn preferably consists of  $\text{SiO}_2$  filaments and/or filaments made of textile glass and/or  $\text{Al}_2\text{O}_3$ -containing inorganic filaments. However, other crimped yarns having high thermal stability and consisting of organic or inorganic materials are not to be excluded. According to a further development of the invention, the latter teaches that seams consisting of a thermally stable thread are provided on the cutting edges of the bearing mat. The seams on the cutting edges produced with a thermally stable thread material assure additional edge protection and contribute to a further improvement in preventing the blowing out in the bearing mat of the invention. Suitable are threads that still have adequate tensile strength at the operating temperature of the bearing mat. Considered can be threads made of textile glass,  $\text{SiO}_2$ , metals and the like.

Furthermore, the object of the invention is a process for producing the bearing mat with the following features:

- (a) Crimped yarn consisting of thermally stable filaments is taken off from rolls in a plurality of strands and laid under tensile stress on a transporting device moving transversely to the direction of pull-off to form a plane, multi-layered flat structure.

- (b) The flat structure, which is moved on with the transporting device, is mechanically reinforced with quilting seams in such a way that the threads of the flat structure continue to be under tensile stress when the flat structure is removed from the transporting device.
- (c) A sewing thread is employed for the quilting seams that has a thermal stability which is lower than the operating temperature of the bearing mat.

As a further development of the invention, the latter provides the instruction that mats are punched from the continuous web, the latter having been mechanically reinforced with quilting seams, and that prior to or after the punching process, seams are applied within the zone of the cutting edges, using a thread consisting of a thermally stable material.

The invention is explained in the following with the help of the drawing showing only one exemplified embodiment. The single drawing shows a flow diagram of the process for producing bearing mats for exhaust gas catalysts.

In a first process step of the manufacturing process shown in the figure, crimped yarn consisting of inorganic filaments

is pulled off from the rolls 2 in a plurality of strands 1 and deposited under tensile stress on a transporting device 3 moving transversely to the direction of take-off, in order to form a plane, multi-layered flat structure 4. As the strands 1 are being laid, they are hooked into the edge-side chains 5 of the transporting device 3. The tensile stress in the strands 1 is maintained in this way. The thickness of the flat structure depends on the type of use. Bearing mats with a thickness of just a few millimeters up to a few centimeters are used depending on the diameter and weight of the catalyst for which the bearing mat is intended. The thickness of the flat structure is adjusted accordingly.

The transporting device 3 passes through a station 6, in which the flat structure 4 is mechanically reinforced with quilting seams 7 in such a way that the threads of the flat structure continue to be under tensile stress when the flat structure 4 is removed from the transporting device 3. A sewing thread is employed for the quilting seams 7 that has a thermal stability which is lower than the operating temperature of the bearing mat.

In a last process step, mats 8 are punched out from the continuous web that has been mechanically reinforced with quilting seams 7, whereby prior to or after the punching process, seams 9 are applied within the zone of the cutting

edges, using a thread consisting of a thermally stable material.

It is understood that the material web mechanically reinforced with quilting seams can also first be wound to an endless ribbon, and that the individual mats can then be produced by punching processes at the location of the customer.

The process shown in the figure is employed for producing binding agent-free bearing mats for supporting exhaust gas catalysts. Said bearing mats consist of a multi-layered flat structure made of inorganic threads, which is mechanically reinforced by quilting seams. It is important for the predetermined function of the bearing mat that the threads consist of a crimped yarn consisting of filaments; that said threads are fixed in the flat structure under tensile stress by the quilting seams; and that the quilting seams are produced with a sewing thread having a thermal stability lower than the operating temperature of the bearing mat. The crimped yarn preferably consists of  $\text{SiO}_2$  filaments and/or filaments made of textile glass and/or  $\text{Al}_2\text{O}_3$ -containing filaments. Synthetic sewing threads which are not heat-stable and which are destroyed when the bearing mat is heated to the operating temperature are used for the quilting seams. The destruction of the sewing threads liberates deformation energy of the crimped yarn, whereby the volume of the bearing mat expands and

the sealing force of the bearing mat clamped between the catalyst and the catalyst housing increases.

Claims

1. A bearing mat for supporting an exhaust gas catalyst in a metallic catalyst housing used for cleaning motor vehicle exhaust gases, characterized by a binding agent-free, multi-layered flat structure consisting of thermally stable threads, said flat structure being mechanically reinforced by quilting seams, whereby

- the threads consist of a crimped yarn consisting of filaments and are fixed under tensile stress in the flat structure by the quilting seams; and
- the quilting seams are produced with a sewing thread having a thermal stability lower than the operating temperature of the bearing mat.

2. The bearing mat according to claim 1, characterized in that the crimped yarn consists of  $\text{SiO}_2$  filaments and/or filaments made of textile glass and/or  $\text{Al}_2\text{O}_3$  containing inorganic filaments.

3. The bearing mat according to claim 1 or 2, characterized in that provision is made for seams on the cutting edges of the bearing mat, said seams consisting of a thermally stable thread, for example textile glass.

4. A process for producing a bearing mat according to any one of claims 1 to 3, whereby

- crimped yarn consisting of thermally stable filaments is pulled off from rolls (2) in a plurality of strands (4) and placed under tensile stress on a transporting device (3) moving transversely to the direction in which they are pulled off for forming a plane, multi-layered flat structure;
- the flat structure (4) moved along by the transporting device (3) is mechanically reinforced with quilting seams (7) in such a way that the threads of the flat structure continue to be under tensile stress when the flat structure (4) is removed from the transporting device (3); and
- a sewing thread is used for the quilting seams (7) having a thermal stability lower than the operating temperature of the bearing mat.

5. The process according to claim 4, whereby mats (8) are punched out of the continuous web mechanically reinforced with quilting seams (7), and that prior to or after the punching process, seams (9) are applied within the zone of the

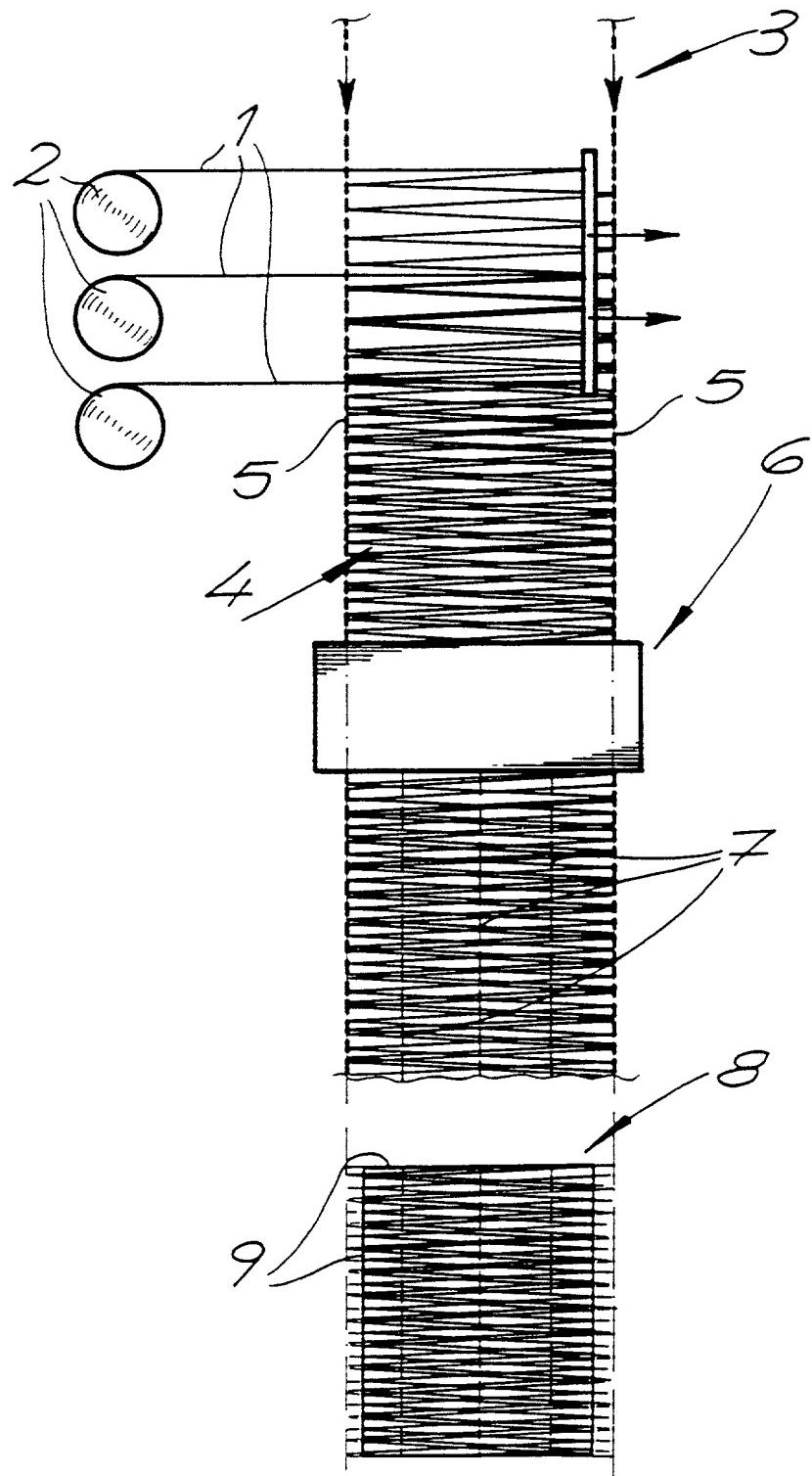
cutting edges, using a thread consisting of a thermally stable material.

## **Abstract**

The object of the invention is a bearing mat for supporting an exhaust gas catalyst in the form of a binding agent-free, multi-layered flat structure consisting of thermally stable threads, said flat structure being mechanically reinforced by quilting seams. The threads consist of a crimped yarn consisting of filaments and are fixed in the flat structure by the quilting seams under tensile stress. The quilting seams are produced with a sewing thread whose thermal stability is lower than the operating temperature of the bearing mat. Furthermore, the object of the invention is a process for producing the mat, in which crimped yarn consisting of thermally stable filaments is taken off from rolls in a plurality of strands and placed under tensile stress on a transporting device moving transversely to the take-off direction in order to form a plane, multi-layered flat structure. The flat structure moved on with the transporting device is mechanically reinforced with quilting seams in such a way that the threads continue to be under tensile stress when the flat structure is removed from the transporting device.

(Single figure)

09/600847



As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**BEARING MAT FOR SUPPORTING AN EXHAUST GAS CATALYST**

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application

Serial No. \_\_\_\_\_

on \_\_\_\_\_,

and was amended

on \_\_\_\_\_ (if applicable).

[ X ] was filed as PCT international application

Number PCT/EP 99/09881

on DECEMBER 14, 1999,

and was amended under PCT Article 19

on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

**PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:**

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
GERMANY	198 58 023.1	16 DECEMBER 1998	[X] YES [ ] NO
GERMANY	199 11 247.9	13 MARCH 1999	[X] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY  
(Includes Reference to PCT International Applications)ATTORNEY'S DOCKET NUMBER  
SCHIERZ ET AL-1 PCT

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application Number)

(Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

## PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check One)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration numbers):

ALLISON C. COLLARD, Registration No. 22,532;

WILLIAM C. COLLARD, Registration No. 38,411

EDWARD R. FREEDMAN, Registration No. 26,048;

FREDERICK J. DORCHAK, Registration No. 29,298-

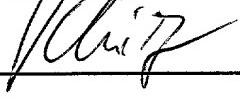
ELIZABETH COLLARD RICHTER, Registration No. 35,103.

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2	FULL NAME OF INVENTOR <u>SCHIERZ</u>	FAMILY NAME <u>SCHIERZ</u>	FIRST GIVEN NAME <u>CLAUS</u>	SECOND GIVEN NAME
0	RESIDENCE & CITIZENSHIP <u>FREIBERG</u>	CITY <u>FREIBERG</u>	STATE OR FOREIGN COUNTRY <u>GERMANY</u>	COUNTRY OF CITIZENSHIP <u>GERMANY</u>
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0	RESIDENCE & CITIZENSHIP <u>NIEDERSCHÖNA</u>	CITY <u>NIEDERSCHÖNA</u>	STATE OR FOREIGN COUNTRY <u>GERMANY</u>	COUNTRY OF CITIZENSHIP <u>GERMANY</u>
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201 	SIGNATURE OF INVENTOR 202 
DATE 07.07.2000	DATE 07.07.2000